CLAIMS

1. A method of bonding lattice-mismatched semiconductors comprising;

forming a Ge-based virtual substrate;

depositing on said virtual substrate a CMP layer that is polished to form a planarized virtual substrate;

bonding a Si substrate to said planarized virtual substrate;

performing layer exfoliation on selective layers of said planarized virtual substrate producing a damaged layer of Ge; and

removing said damaged layer of Ge.

2. The method of claim 1, wherein said virtual substrate comprises an etch-stop layer.

3. The method of claim 1, wherein said virtual substrate comprises a III-V transfer layer.

4. The method of claim 3, wherein said III-V transfer layer serves as an etch-stop.

5. The method of claim 1, wherein said virtual substrate comprises a $Si_{1-x}Ge_x$ passivation layer.

6. The method of claim 1, wherein said virtual substrate comprises a Si_3N_4 passivation layer.

7. The method of claim 1, wherein said CMP layer comprises an oxide.

8. The method of claim 1, wherein said CMP layer comprises Si.

9. The method of claim 2 further comprising removing said etch-stop layer after removing said damaged Ge layer.

10. The method of claim 9, wherein said etch-stop comprises $Si_{0.4}Ge_{0.6}$.

11. The method of claim 9, wherein said virtual substrate comprises at least one relaxed Ge layer and SiGe buffer.

12. A method of bonding lattice-mismatched semiconductors comprising;

forming a virtual substrate;

using said virtual substrate to form a planarized virtual substrate;

bonding a Si substrate to said planarized virtual substrate; and

removing selective layers of said planarized virtual substrate associated with said virtual substrate.

13. The method of claim 12, wherein said virtual substrate comprises an etch-stop layer.

14. The method of claim 12, wherein said virtual substrate comprises a III-V transfer layer.

15. The method of claim 14, wherein said III-V transfer layer serves as an etch-stop.

16. The method of claim 12, wherein said virtual substrate comprises a $Si_{1-x}Ge_x$ passivation layer.

17. The method of claim 12, wherein said virtual substrate comprises a Si_3N_4 passivation layer.

18. The method of claim 12, wherein said planarized virtual substrate is formed using oxide.

1 19. The method of claim 12, wherein said wherein said planarized virtual substrate is
2 formed using $Si_{1-x}Ge_x$.

1 20. The method of claim 13 further comprising removing said etch-stop layer after
2 removing said damaged Ge layer.

1 21. The method of claim 20, wherein said etch-stop comprises $Si_{0.4}Ge_{0.6}$.